PHED SURROGATE EXPOSURE GUIDE

Estimates of Worker Exposure from
The Pesticide Handler Exposure Database Version 1.1
August 1998

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-Glossary

INTRODUCTION

Hello!

This document, the Pesticide Handler Exposure Database (PHED) surrogate worker exposure guide, contains **basic** pesticide handler scenarios. The data contained in the following tables are summaries of the worker exposure outputs generated by PHED. These estimates were derived from actual field studies and are based on the physical factors of a handler scenario (e.g., the type of protective clothing worn, method of application, formulation type, etc.).

This manual is divided into 3 sections. **Section 1** discusses how this guide is most effectively used. This section details essentials for the new user, including explanations of data confidence, replicates, protective clothing, cab types, and formulas. It also instructs you how to incorporate the PHED Dermal and Inhalation unit exposure estimates into your Average Daily Dose (ADD), Average Annual Daily Dose (AADD) and Lifetime Average Daily Dose (LADD) equations.

Section 2 contains tables of worker exposure estimates. It is divided into four parts, based on a specific handler function. These four parts are 1) mixer/loader 2) applicator 3) flagger and 4) mixer/loader/applicator. Each page refers to a specific handler scenario (e.g. wettable powder, open pour mixing and loading) and contains three different tables. The first table provides the user with an estimate of dermal unit exposure. The dermal unit exposure estimates are based on three different clothing scenarios. These scenarios are 1) "no clothes", which provides an estimation of exposure for a handler with no protective clothing (i.e., total deposition); 2) long sleeve shirt, long pants, and no gloves; and 3) long sleeve shirt, long pants, and chemical resistant gloves. The dermal exposure has been divided into sections of the body. These sections are 1) head and neck; 2) upper arm, forearm, chest, back, thigh, and lower leg; and 3) hand. This table is useful because it allows the reviewer to see which parts of the body are most vulnerable to exposure from a given handler scenario. Additionally a reviewer can apply arithmetically estimated protection factors (NOTE: it should be stressed that applying arithmetically estimated protection factors should be done **only** in the absence of good data). Finally, this table allows the reviewer to better evaluate changes in exposure from the addition of PPE. **The TOTAL dermal exposure is provided in the final column of this table.**

The number of replicates and grade quality are listed in the second table. This table also includes anything noteworthy about the PHED analysis (e.g., high percentage of non-detects, spills, etc.).

The inhalation exposure, replicate number and grade quality are listed in the third table at the bottom of each page.

Section 3 is the appendix of this guide and lists the studies that went into each handler scenario. The importance of knowing which studies were used to estimate exposure can not be emphasized enough. **This table is not a panacea**. These estimates of exposure are very basic and may not be appropriate for every situation. The reviewer should always be familiar with the studies that were used in his or her analysis. In addition to the listing of studies, there are also definitions of formulations and methods of application in the appendix.

PHED can often be complicated. Don't give up! A good understanding of the database and what it can (and can't) do is your best weapon.

Enjoy

Tracy Lynn Keigwin
April, 1997
Revised August 1998

SECTION 1

COMMENTS and FORMULAS for the NEW USER

GRADING PHED STUDIES

Each study in PHED has been graded from "A" to "E" according to certain QA/QC factors

Data Grade	% Lab Recovery	CV* for Lab recovery	% Field Recovery	% Storage Stability	Data Corrected For:***
A	90-110	≤15	70-120	**	Field Recovery
B	80-110	≤25	50-120	**	Field Recovery
C	70-120 70-120	≤33 ≤33	30-120 or missing	** 50-120	Field Recovery
D	60-120	≤33	**	**	Field Recovery if available; if not then storage stability, if not then lab recovery
E	**Does not meet above criteria**				

* CV = Coefficient of Variation
** Does not matter if available or missing
*** If a field recovery of 90% or greater is obtained, no correction of the data is necessary

DATA CONFIDENCE

Data confidence refers to both the **quality** and the **amount** of data for each PHED run. Each study in PHED has been graded from "A" to "E" according to certain Quality Assurance/Quality Control (QA/QC) factors:

High Confidence Run/:
AB GRADE/15 Reps Grades A and B **-AND-** at least 15 replicates per body part. PHED runs having any combination of A or B grade data are listed as "AB grade" data in the tables.

Medium Confidence Run:
ABC GRADE/15 Reps Grades A, B, or C **-AND-** at least 15 replicates per body part. PHED runs having any combination of A,B,and C grade data are listed as "ABC grade" data in the tables.

Low Confidence Run/:
"ALL GRADE" Any run that includes D or E grade data **- OR -** has less than 15 replicates per body part. PHED runs which include "D" or "E" grade data are referred to as having **"ALL GRADE" data**. "ALL GRADE" data are always low confidence.

REPLICATES

The term "replicates" refers to the number of observations for a specific body location. For example, "20 to 35 replicates", means that the number of observations, **per body location,** ranges between 20 and 35.

DATA CONFIDENCE AND COMMENT BOX

The Comment Box discusses the grade quality, number of replicates and any items of note for a particular use scenario. For example: if the comment box lists a use scenario as "Dermal = 75 to 121 replicates, AB grade. Hand = 53 replicates, AB grade. **High Confidence run**" this would mean that the head, neck, upper arm, forearm, chest, back, thigh and lower leg replicates range between 75 to 121 and are of AB grade and that there are 53 hand replicates of AB grade. This would be considered a high confidence run because there are at least 15 replicates per body part of AB grade.

TYPES OF CLOTHING

"No Clothing" : This scenario is the most conservative estimate of exposure. Data collection is made with dosimeters/patches worn outside of all clothing. Examples of uses for this scenario might be with aerosol applications or for other residential uses. This might be a good choice when estimating exposure for a developing country where PPE are often not used.

Single Layer - definition **When this table refers to "Single Layer" it means either long sleeve shirt and long pants or coveralls**. **There are two types of "single layer" clothing scenarios in this table**:

1) Single Layer, No Gloves:
This is the exposure when a handler is wearing a long sleeve shirt and pants or coveralls and no gloves. The dosimeters/patches are worn underneath one layer of permeable clothing

2) Single Layer, Gloves:
This is the exposure a handler would receive when wearing a long sleeve shirt and pants or coveralls and chemical resistant gloves. The dosimeters/patches are worn underneath one layer of permeable clothing.

RESIDENTIAL EXPOSURE

Residential uses are not covered by the WPS (Worker Protection Standard) and the clothing worn by a homeowner will often be less protective than the PPE worn by a commercial applicator. Assessors should consult the Residential Exposure SOPs which discuss the estimation of residential exposure.

CAB TYPES

Open Cab/Cockpit:"No cabs" (Code 1) and enclosed cabs with windows open (Code 2).

Closed Cab/Cockpit: Enclosed Cabs with windows closed (Code 3) and enclosed cabs with filtered air (Code 4).

FEET

PHED contains a small number of data entry errors for foot exposure. Because of this, foot exposure estimations have not been included in the estimation of Dermal Exposure. These errors will be corrected when PHED version 2.0 is released.

CALCULATIONS

Arithmetically estimated protection factors are sometimes used when data for handlers wearing the specified PPE are not available. In the following exposure mitigation table is a list of estimated protection factors (agreed to by USEPA/OPP/HED Science Peer Review Committee). These protection factors should be considered interim measures only.

EXPOSURE MITIGATION TABLE

PPE	% reduction in exposure	NOTE
Long sleeve shirt and long pants or full coveralls	50% reduction in exposure to covered parts	This estimate is being reviewed by EPA, Health Canada and CADPR. The percent reduction in exposure afforded by coveralls may be increased in the future. Please verify this protection factor before proceeding. As of January, 1998, HED's policy is 50%.
Chemical resistant gloves	90% reduction in exposure to hands	
Dust/Mist respirator	80% reduction in inhalation exposure	
Organic vapour respirator	90% reduction in inhalation exposure	
Enclosed Cabs	98% reduction in both dermal and inhalation exposure	

HOW TO APPLY A PROTECTION FACTOR

Multiply the unit exposure for the body parts of concern (from exposure tables) by the percentage of those body parts that will still be exposed after PPE protection is applied. For instance: suppose the PHED exposure table lists the "no glove" hand exposure for a particular use scenario as 0.05 mg/lb ai handled, and you want to estimate hand exposure if the applicator wore gloves. From the exposure mitigation table you find that gloves provide a 90% protection factor (i.e., 10% of the hands remain unprotected). Therefore, if you multiply your "no glove" hand exposure (0.05 mg/lb ai handled) by the unprotected proportion of the hand (0.1) your gloved hand exposure would be 0.005 mg/lb ai handled.

Examples of applying protection factors:

If the estimated unit exposure is:	**and you want to**:	**The arithmetically estimated exposure is:**
"No glove" hand exposure is 0.130 mg/lb ai handled	estimate gloved hand exposure	0.130 x 0.1 = 0.013 mg/lb ai handled
Inhalation exposure = 0.023 mg/lb ai handled	estimate inhalation exposure when wearing a dust-mist respirator	0.023 x 0.2 = 0.0046 mg/lb ai handled
Open cab dermal exposure = 0.170 mg/lb ai handled	estimate dermal exposure when using a enclosed cab	0.170 x 0.2 = 0.0034 mg/lb ai applied

Additional layer of clothing

Adding another protective layer of clothing (e.g., a second layer of clothing or coveralls) reduces exposure to relevant body parts (i.e., upper and lower body) by 50%. Therefore, in order to estimate the exposure after adding more clothing:

1) Multiply the value for the upper and lower body by 0.50.
2) Add this revised value for the upper and lower body to the columns for the head and the column for the hands to obtain the new total dermal exposure estimate.

HOW TO "BACK CALCULATE"

"Back-calculating" is literally the reverse of applying a protection factor and is used when a baseline (i.e., no gloves) estimate of exposure is necessary and the data are unavailable. For example, if PHED contains monitored data for "gloved" hand exposure as 0.005 mg/lb ai handled, and you want to estimate "no glove" exposure, you "back calculate" by **dividing** the gloved exposure value by the portion of unprotected hand (10% or 0.1). Your estimated "no glove" exposure is then 0.05 mg/lb ai handled.

Examples of Back Calculating:

If the estimated unit exposure is:	**and you want to**:	**The arithmetically estimated exposure is:**
"glove" hand exposure is 0.0059 mg/lb ai handled	estimate "no glove" hand exposure	0.0059 ÷ 0.1 = 0.059 mg/lb ai handled

USING PHED UNIT EXPOSURE ESTIMATES IN YOUR EXPOSURE CALCULATIONS

The estimates in this guide only provide you with the first stepping stone in estimating worker exposure. In order to estimate average daily dose, average annual daily dose and lifetime average daily dose, you will need to use your PHED unit exposure estimates in the equations listed below. Assessors should characterize the dose as either "potential" or "absorbed" depending upon the use of dermal absorption data. For more details on exposure and risk calculations, readers should refer to Series 875, Group B, Part D.

Average Daily Dose (ADD) =

Dermal Exposure

$$\frac{\text{(PHED Unit Exposure) (maximum label rate) (max acres treated/day) (\% dermal absorption*)}}{\text{60 or 70 kg body weight**}}$$

Inhalation Exposure

$$\frac{\text{(PHED Unit Exposure) (maximum label rate) (max acres treated/day) (1mg/1000 µg) (\% inhalation absorption)}}{\text{60 or 70 kg body weight**}}$$

* Do Not multiply by the dermal absorption if your NOEL is based on a dermal study.

** A 60 kg body weight is used when calculating daily exposure if there are developmental toxicity concerns, otherwise, a 70 kg body weight is used.

SECTION 2

EXPOSURE TABLES

SCENARIO 1. DRY FLOWABLE, OPEN MIXING and LOADING (MLOD)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.0186		1.05		0.00952	=	**1.1**
Single Layer, No Gloves	0.0186	+	0.0382	+	0.00952		**0.066**
Single Layer, Gloves	0.0186		0.0382		0.0097		**0.066**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal = 16 - 19 replicates, AB grade. Hand = 7 replicates, AB grade. **Low Confidence** due to the small number of hand replicates.
Single Layer, No Gloves	Dermal = 16 - 26 replicates, AB grade. Hand = 7 replicates, AB grade. **Low Confidence** due to the small number of hand replicates.
Single Layer, Gloves	Dermal = 16 - 26 replicates, AB grade. Hand = 21 replicates, AB grade. NOTE: this run has a lot of non-detects for the glove exposure values. **High Confidence**

Inhalation Exposure and Data Confidence

0.77 µg/lb ai handled . Replicates = 23, AB grade. **High Confidence**

SCENARIO 2. GRANULAR, OPEN MIXING and LOADING (MLOD)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00130		0.0285		0.00184	=	**0.032**
Single Layer, No Gloves	0.00130	+	0.00523	+	0.00184		**0.0084**
Single Layer, Gloves	0.00130		0.00523		0.000345		**0.0069**
Coveralls over Single Layer, Gloves	0.00130		0.00174		0.000345		**0.0034**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 25 - 59, ABC grade. Hand = 10 replicates, All grade. **Low Confidence** due to the poor grade quality of the hand replicates and low replicate number.
Single Layer, No Gloves	Dermal replicates = 33 - 78, ABC grade. Hand = 10 replicates, All grade. **Low Confidence** due to the poor grade quality of the hand replicates and low replicate number.
Single Layer,Gloves	Dermal replicates = 33 - 78, ABC grade. Hand = 45 replicates, AB grade. **Medium Confidence**
Coveralls over Single Layer, Gloves	Dermal replicates = 12 - 59, ABC grade. Hand = 45 replicates, AB grade. **Low Confidence** due to the low replicate number for many body parts.

Inhalation Exposure and Data Confidence

1.7 µg/lb ai handled. 58 replicates, AB grade. **High Confidence**

SCENARIO 3. ALL LIQUIDS, OPEN MIXING and LOADING (MLOD)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00527		0.301		2.84	=	**3.1**
Single Layer, No Gloves	0.00527	+	0.0110	+	2.840		**2.9**
Single Layer, Gloves	0.00527		0.0110		0.00671		**0.023**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	**Data Confidence/Items of Note**
No Clothes	Dermal = 75 to 122 replicates, AB grade. Hand = 53 replicates, AB grade. **High Confidence**
Single Layer, No Gloves	Dermal = 72 to 122 replicates, AB grade. Hand = 53 replicates, AB grade. **High Confidence**
Single Layer, Gloves	Dermal = 72 to 122 replicates, AB grade. Hand = 59 replicates, AB grade. **High Confidence**

Inhalation Exposure and Data Confidence

1.2 µg/lb ai handled. Replicates = 85, AB grade. **High Confidence**

SCENARIO 4. WETTABLE POWDER, OPEN MIXING and LOADING (MLOD)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.0776	+	3.06	+	3.56	=	**6.7**
Single Layer, No Gloves	0.0776		0.0760		3.560		**3.7**
Single Layer, Gloves	0.0776		0.0760		0.0138		**0.17**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 14-24, ABC grade. Hand replicates = 7, ABC grade. **Low Confidence** due to the low number of hand replicates (There were additional "D" and "E" grade hand replicates but hand exposure would have been reduced significantly and the data confidence would still have been quite low). Additionally, all the body parts did not have at least 15 replicates.
Single Layer, No Gloves	Dermal replicates = 22-45, ABC grade. Hand replicates = 7, ABC grade. **Low Confidence** due to the low number of hand replicates (There were additional "D" and "E" grade hand replicates but hand exposure would have been reduced significantly and the data confidence would still have been quite low).
Single Layer, Gloves	Dermal replicates = 22-45, ABC grade. Hand replicates = 24, ABC grade. **Medium Confidence**

Inhalation Exposure and Data Confidence

43.4239 µg/lb ai handled. 44 replicates, ABC grade. **Medium Confidence**

SCENARIO 5. WETTABLE POWDER, WATER SOLUBLE BAGS (MLOD)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00147		0.0260		0.0112	=	**0.039**
Single Layer, No Gloves	0.00147	+	0.00827	+	0.0112		**0.021**
Single Layer, Gloves	0.00147		0.00827		0.0000625		**0.0098**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 6 - 15, AB grade. Hand replicates = 5, AB grade. **Low Confidence** due to the low replicate number per body part.
Single Layer, No Gloves	Dermal replicates = 6 - 15, AB grade. Hand replicates = 5, AB grade. **Low Confidence** due to the low replicate number per body part. Additionally, this run is based largely on non-detects.
Single Layer, Gloves	Dermal replicates = 6 - 15, AB grade. Hand replicates = 9, All grade. **Low Confidence** due to the low replicate number per body part. Additionally, this run is based largely on non-detects (e.g., all gloved data are nondetect).

Inhalation Exposure and Data Confidence

0.24 µg/lb ai handled. Replicates = 15, All grade. **Low Confidence** (all grade data)

SCENARIO 6. ALL LIQUIDS, CLOSED MIXING and LOADING (MLOD)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000924	+	0.0330	+	No Data	=	**See Note** (below)
Single Layer, No Gloves	0.00126		0.00564		No Data		**See Note** (below)
Single Layer, Gloves	0.00126		0.00564		0.00168		**0.0086**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal = 14 to 40 replicates, All grade. Hand = 0 replicates. **Low Confidence** due to the lack of "no glove" hand replicates. The reviewer will need to back calculate the gloved hand value and add this estimate to the "no clothes" scenario to estimate Total Dermal Exposure.
Single Layer, No Gloves	Dermal = 16 to 22 replicates, AB grade. Hand = 0 replicates. **Low Confidence** due to the lack of "no glove" hand replicates. The reviewer will need to back calculate the gloved hand value and add this estimate to the "single layer, no gloves" scenario to estimate Total Dermal Exposure.
Single Layer, Gloves	Dermal = 16 to 22 replicates, AB grade. Hand = 31 replicates, AB grade. **High Confidence**

Inhalation Exposure and Data Confidence

0.083 µg/lb ai handled. Replicates = 27, AB grade. **High Confidence**

SCENARIO 7. AERIAL-FIXED WING/Enclosed Cockpit/Liquid Application (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000156		0.00174		0.00311	=	**0.0050**
Single Layer, No Gloves	0.000156	+	0.00174	+	0.00311		**0.0050**
Single Layer, Gloves	0.000156		0.00174		0.000287		**0.0022**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 20 to 28, AB grade. Hand replicates = 34, AB grade. **High Confidence**
Single Layer, No Gloves	Dermal replicates = 24 to 48, ABC grade. Hand replicates = 34, AB grade. **Medium Confidence**
Single Layer, Gloves	Dermal replicates = 24 to 48, ABC grade. Hand replicates = 7, All grade. **Low Confidence** due to inadequate hand number and poor grade quality.

Inhalation Exposure and Data Confidence

0.068 µg/lb ai handled. 23 replicates, ABC grade. **Medium Confidence**

SCENARIO 8. AERIAL-FIXED WING/Enclosed Cockpit/Granular Application (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000355		0.00398		0.0000735	=	**0.0044**
Single Layer, No Gloves	0.000355	+	0.00125	+	0.0000735		**0.0017**
Single Layer, Gloves	0.000355		0.00125		0.0000756		**0.0017**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 9 to 13, C grade. Hand replicates = 4, All grade. **Low Confidence** due to inadequate replicate number and poor grade quality.
Single Layer, No Gloves	Dermal replicates = 0 to 13, C grade. Hand replicates = 4, All grade. **Low Confidence** due to inadequate replicate number and poor grade quality. The lower body (thighs and lower legs) were not monitored. All other body parts, including feet, are represented by 9 to 13 observations (only 7 of 103 dermal samples (including hands) are nondetect).
Single Layer, Gloves	Dermal replicates = 0 to 13, C grade. Hand replicates = 9, All grade. **Low Confidence** due to inadequate replicate number and poor grade quality. The lower body (thighs and lower legs) were not monitored. All other body parts, including feet, are represented by 9 to 13 observations (only 7 of 103 dermal samples (including hands) are nondetect).

Inhalation Exposure and Data Confidence

1.3 µg/lb ai handled. 13 replicates, All grade. **Low Confidence** due to the low replicate number and poor grade quality.

SCENARIO 9. ROTARY (Helicopter) APPLICATION, ENCLOSED COCKPIT (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000156		No Data		0.0000512	=	**See Note** (below)
Single Layer, No Gloves	0.000156	+	0.00174	+	0.0000512		**0.0019**
Single Layer, Gloves	0.000156		0.00174		0.0000446		**0.0019**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 0 to 3, C grade. Hand replicates = 1, A grade. **Extremely Low Confidence** due to inadequate dermal and hand replicates.
Single Layer, No Gloves	Dermal replicates = 3, C grade. Hand replicates = 2, A grade. **Extremely Low Confidence** due to inadequate dermal and hand replicates.
Single Layer, Gloves	Dermal replicates = 3, C grade. Hand replicates = 1, A grade. **Extremely Low Confidence** due to inadequate dermal and hand replicates.

Inhalation Exposure and Data Confidence

0.0018 µg/lb ai handled. Replicates = 3, A grade. **Low Confidence** due to inadequate replicate number.

Note: All dermal (excluding hands) samples are nondetect (LOQ - 0.01 µg/cm^2). All hand and airborne samples are above the LOQ. The policy of the Exposure Science Advisory Committee (EXPO SAC) is not to quantify this scenario in risk assessment using these unit exposures because there are insufficient data points.

SCENARIO 10. AEROSOL APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	45.5	+	327	+	106	=	**480**
Single Layer, No Gloves	45.5		35.4		106		**190**
Single Layer, Gloves	45.5		35.4		0.532		**81**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 15, AB grade. Hand replicates = 15, Grade A. **High Confidence**
Single Layer, No Gloves	Dermal replicates = 15, AB grade. Hand replicates = 15, Grade A. **High Confidence**
Single Layer, Gloves	Dermal replicates = 15, AB grade. Hand replicates = 15, Grade A. **High Confidence**

Inhalation Exposure and Data Confidence

1,300 µg/lb ai handled. 15 replicates, AB grade. **High Confidence**

Note: Although the unit exposure appears higher, the values are normalized by lb ai applied. The amount of ai applied per replicate was only 0.01 lb ai (one aerosol can). This scenario represents an insecticide crack/crevice treatment.

SCENARIO 11. AIRBLAST APPLICATION, OPEN CAB (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.197	+	1.86	+	0.123	=	**2.2**
Single Layer, No Gloves	0.197		0.0421		0.123		**0.36**
Single Layer, Gloves	0.197		0.0421		0.00243		**0.24**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 33 to 44, AB grade. Hand replicates = 22 replicates, AB grade. **High Confidence**
Single Layer, No Gloves	Dermal replicates = 32 to 49, AB grade. Hand replicates = 22 replicates, AB grade. **High Confidence**
Single Layer, Gloves	Dermal replicates = 31 to 48, AB grade. Hand replicates = 18 replicates, AB grade. **High Confidence**

Inhalation Exposure and Data Confidence

4.5 µg/lb ai handled. 47 replicates, AB grade. **High Confidence**

Note: The three turf airblast replicates (golf course) are not included in this scenario. Only tree crops and grapes are included.

SCENARIO 12. AIRBLAST APPLICATION, ENCLOSED CAB (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00418	+	0.0450	+	No Data	=	**See Note** (below)
Single Layer, No Gloves	0.00418		0.00186		No Data		**See Note** (below)
Single Layer, Gloves	0.00418		0.00186		0.0129		**0.019**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 20, AB grade. Hand replicates = 0. **Low Confidence** due to the lack of "no glove" replicates. The only way to estimate "no glove" hand exposure is to back-calculate from the gloved hand value.
Single Layer, No Gloves	Dermal replicates = 20 to 30, AB grade. Hand replicates = 0. **Low Confidence** due to the lack of "no glove" replicates. NOTE: Although not surprising for an enclosed cab scenario, there are a high number of non-detects for this scenario. The only way to estimate "no glove" hand exposure is to back-calculate from the gloved hand value.
Single Layer, Gloves	Dermal replicates = 20 to 30, AB grade. Hand replicates = 20, AB grade. NOTE: Although not surprising for an enclosed cab scenario, there are a large number of non-detects for this scenario. **High Confidence**

Inhalation Exposure and Data Confidence

0.45 µg/lb ai handled. 9 replicates, ABC grade. **Low Confidence** (less than 15 replicates)

SCENARIO 13. GROUNDBOOM APPLICATION, OPEN CAB (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00161	+	0.0381	+	0.00650	=	**0.046**
Single Layer, No Gloves	0.00161		0.00612		0.00650		**0.014**
Single Layer, Gloves	0.00161		0.00612		0.00629		**0.014**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 17 to 33, AB grade. Hand replicates = 29, AB grade. **High Confidence**
Single Layer, No Gloves	Dermal replicates = 23 to 42, AB grade. Hand replicates = 29, AB grade. The neck location is limited to 23 observations; the next lowest number of observations is 32. **High Confidence**
Single Layer, Gloves	Dermal replicates = 23 to 42, AB grade. Hand replicates = 21, ABC grade. The neck location is limited to 23 observations; the next lowest number of observations is 32. **Medium Confidence**

Inhalation Exposure and Data Confidence

0.74 µg/lb ai handled. 22 replicates, AB grade. **High Confidence**

SCENARIO 14. GROUNDBOOM APPLICATION, ENCLOSED CAB (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000171		0.00933		0.000836	=	**0.010**
Single Layer, No Gloves	0.000171	+	0.00401	+	0.000836		**0.0050**
Single Layer, Gloves	0.000171		0.00401		0.0009		**0.0051**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 13 to 26, ABC grade. Hand replicates = 16, ABC grade. **Low Confidence** due to the low number of replicates per body part.
Single Layer, No Gloves	Dermal replicates = 20 to 31, ABC grade. Hand replicates = 16, ABC grade. **Medium Confidence**
Single Layer, Gloves	Dermal replicates = 20 to 31, ABC grade. Hand replicates = 12, All grade. **Low Confidence** due to the grades and small number of hand replicates.

Inhalation Exposure and Data Confidence

0.043 µg/lb ai handled. 16 replicates, AB grade. **High Confidence**

SCENARIO 15. SOLID BROADCAST SPREADER APPLICATION/ OPEN CAB, AG USES (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000863	+	0.0354	+	0.00304	=	**0.039**
Single Layer, No Gloves	0.000863		0.00603		0.00304		**0.0099**
Single Layer, Gloves	0.000863		0.00603		**No Data**		**See Note (below)**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal Replicates = 1 to 5, AB grade. Hand replicates = 5, AB grade. **Low Confidence** due to inadequate replicate number.
Single Layer, No Gloves	Dermal Replicates = 1 to 5, AB grade. Hand replicates = 5, AB grade. **Low Confidence** due to inadequate replicate number.
Single Layer, Gloves	Dermal replicates = 1 to 5, AB grade. Hand replicates = 0. **Low Confidence** due to inadequate replicate number. **NOTE**: Gloved hand replicates are unavailable for this exposure scenario. The only way to estimate gloved hand exposure is to reduce the "no glove" hand value by 90% and add this value to columns A and B.

Inhalation Exposure and Data Confidence

1.2 µg/lb ai handled 5 replicates, AB grade. **Low Confidence** due to the low replicate number.

SCENARIO 16. SOLID BROADCAST SPREADER APPLICATION/ENCLOSED CAB, AG USES (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000156	+	0.00174	+	0.000212	=	**0.0021**
Single Layer, No Gloves	0.000156		0.00174		0.000212		**0.0021**
Single Layer, Gloves	0.000156		0.00174		0.0000606		**0.0020**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 2 to 27 AB grade. Hand replicates = 24, AB grade. **Low Confidence** due to inadequate replicate number. The majority of the body parts are represented by only 2 replicates.
Single Layer, No Gloves	Dermal replicates = 2 to 30, AB grade. Hand replicates = 24, AB grade. **High Confidence** due to inadequate replicate number. The neck data are limited to 2 observations, otherwise, the replicates range from 27 to 30 for dermal (non-hand).
Single Layer, Gloves	Dermal replicates = 2 to 30, AB grade. Hand replicates = 17, AB grade. **High Confidence** due to inadequate replicate number. The neck data are limited to 2 observations, otherwise, the replicates range from 27 to 30 for dermal (non-hand).

Inhalation Exposure and Data Confidence

0.2201 µg/lb ai handled. 37 replicates, AB grade. **High Confidence**

Note: Application equipment includes drop-type spreaders and row planters.

SCENARIO 17. GRANULAR BAIT DISPERSED BY HAND (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	5.67	+	71.8	+	No Data	=	**See Note** (Below)
Single Layer, No Gloves	5.67		62.0		No Data		**See Note** (Below)
Single Layer, Gloves	5.67		62.0		3.61		**71**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 16, ABC grade. Hand replicates = 0. **Low Confidence** due to lack of "no glove" replicates for this use scenario. The only way to estimate "no glove" hand exposure is to back-calculate the gloved estimate.
Single Layer, No Gloves	Dermal replicates = 16, ABC grade. Hand replicates = 0. **Low Confidence** due to lack of "no glove" replicates for this use scenario. The only way to estimate "no glove" hand exposure is to back-calculate the gloved estimate.
Single Layer, Gloves	Dermal replicates = 16, ABC grade. Hand replicates = 15, ABC grade. **Medium Confidence**

Inhalation Exposure and Data Confidence

470 µg/lb ai handled. 16 replicates, ABC grade. **Medium Confidence**

Note: The 15 hand replicates are all nondetect (LOQ = 41 μg).

SCENARIO 18. LOW PRESSURE HANDWAND APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	1.09	+	18.5	+	4.92	=	**25**
Single Layer, No Gloves	1.09		5.97		4.92		**12**
Single Layer, Gloves	1.09		5.97		0.0160		**7.1**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 13, C grade. Hand replicates = 9, B,C grade. **Low Confidence** due to inadequate replicate number.
Single Layer, No Gloves	Dermal replicates = 13, C grade. Hand replicates = 9, B,C grade. **Low Confidence** due to inadequate replicate number.
Single Layer, Gloves	Dermal replicates = 13, C grade. Hand replicates = 4, B,C grade. **Low Confidence** due to inadequate replicate number.

Inhalation Exposure and Data Confidence

940 µg/lb ai applied. 13 replicates, ABC grade. **Low Confidence** due to inadequate replicate number.

NOTE: In most instances, the same individual would be responsible for mixing/loading and applying using a low pressure handwand sprayer. Therefore, the exposures from Scenario 32 (i.e., low pressure handwand mixer/loader/applicator) are more appropriate.

SCENARIO 19. HIGH PRESSURE HANDWAND APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.0836		12.2		1.16	=	**13**
Single Layer, No Gloves	0.0836	+	0.550	+	1.16		**1.8**
Single Layer, Gloves	0.0836		0.550		0.00625		**0.64**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal Replicates = 9 to 11, All grade. Hand replicates = 2, All grade. **Low Confidence** due inadequate replicate number and poor grade quality.
Single Layer, No Gloves	Dermal Replicates = 9 to 11, All grade. Hand replicates = 2, All grade. **Low Confidence** due inadequate replicate number and poor grade quality.
Single Layer, Gloves	Dermal Replicates = 9 to 11, All grade. Hand replicates = 9, All grade. **Low Confidence** due inadequate replicate number and poor grade quality. Additionally, the gloved hand values are based primarily on non-detects.

Inhalation Exposure and Data Confidence

79 µg/lb ai handled. 11 replicates, All grade. **Low Confidence** due to low replicate number and poor grade quality.

Note: Monitoring included applications to poultry manure indoors (n = 9) and to weeds and brush (n = 2) outdoors. All replicates applied a pesticide at 200 psi.

SCENARIO 20. BACKPACK APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	9.78	+	394	+	276	=	**680**
Single Layer, No Gloves	9.78		No Data		276		**See Note** (below)
Single Layer, Gloves	9.78		No Data		No Data		**See Note** (below)

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 69, AB grade. Hand replicates = 60, AB grade. **High Confidence**
Single Layer, No Gloves	Dermal replicates = 69, AB grade **(head and neck only)** . Hand replicates = 60, AB grade. **Low Confidence** due to absence of dermal replicates. A protection factor may be applied to estimate the protection afforded by one layer of clothing.
Single Layer, Gloves	Dermal replicates = 69, AB grade **(head and neck only)**. Hand replicates = 0. **Low Confidence** due to the absence of both dermal and hand replicates. A protection factor may be applied to estimate the protection afforded by one layer of clothing and gloves.

Inhalation Exposure and Data Confidence

330 µg/lb ai handled. 40 replicates, AB grade. **High Confidence**

NOTE: Many of the studies used in this PHED scenario have used different application practices than in the United States (i.e., broadcast application in tea, rubber). This has lead to a potential over estimate of exposure for a typical spot treatment. The reviewer should pull the PHED studies (see appendix) and review them to see if the application procedures are acceptable. In most instances, the same individual would be responsible for mixing/loading and applying using a backpack sprayer. Therefore, the exposures from Scenario 34 (i.e., backpack mixer/loader/applicator) are more appropriate.

SCENARIO 21. HAND GUN (LAWN) SPRAYER (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	No Data		No Data		No Data	=	No Data
Single Layer, No Gloves	No Data	+	No Data	+	No Data		No Data
Single Layer, Gloves	No Data		0.290		0.0480		0.34

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	No Data
Single Layer, No Gloves	No Data
Single Layer, Gloves	Dermal replicates = 0 to 14, C grade. Hand replicates = 14, C grade. **Low Confidence**

Inhalation Exposure and Data Confidence

1.4 μg/lb ai handled. Replicates = 14, B grade. **Low Confidence**

SCENARIO 22. PAINTBRUSH APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	2.46	+	78.7	+	175	=	**260**
Single Layer, No Gloves	2.46		3.81		175		**180**
Single Layer, Gloves	2.46		3.81		No Data		**See Note (Below)**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 14 to 15, C grade. Hand replicates = 15, AB grade. **Low to Medium Confidence** due to inadequate replicate number. All body parts are represented by 15 replicates except for the forearms (n = 14).
Single Layer, No Gloves	Dermal replicates = 14 to 15, C grade. Hand replicates = 15, AB grade. **Low Confidence** due to inadequate replicate number. All body parts are represented by 15 replicates except for the forearms (n = 14).
Single Layer, Gloves	Dermal replicates = 14 to 15, C grade. Hand replicates = 0. **Low Confidence** due to inadequate replicate number. All body parts are represented by 15 replicates except for the forearms (n = 14).

Inhalation Exposure and Data Confidence

280 µg/lb ai handled. 15 replicates, C grade. **Medium Confidence**

NOTE: PHED V1.1 incorrectly lists the amount of active ingredient handled. The correct lb ai handled for replicates 0467 CC, DD, EE, FF, GG, HH, JJ, KK, LL, MM, and NN is 0.0510 lb ai, not 0.0253 lb ai. The exposure estimates in this table represent the recalculated (correct) values.

SCENARIO 23. AIRLESS SPRAYER (EXTERIOR HOUSE STAIN) APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	10.2		77.7		26.7	=	**110**
Single Layer, No Gloves	10.2	+	1.47	+	26.7		**38**
Single Layer, Gloves	10.2		1.47		No Data		**See Note** (below)

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 15, B grade. Hand replicates = 15, B grade. **High Confidence**
Single Layer, No Gloves	Dermal replicates = 15, B grade. Hand replicates = 15, B grade. **High Confidence**
Single Layer, Gloves	Dermal replicates = 15, B grade. Hand replicates = 0. **Low Confidence** due to lack of hand replicates. The reviewer will need to add a 90% protection factor to the "no gloved" hand value and add this estimate to the "single layer, gloves" scenario to estimate Total Dermal Exposure.

Inhalation Exposure and Data Confidence

830 µg/lb ai handled. 15 replicates, C grade. **Medium Confidence**

NOTE: There is only one study in PHED Version 1.1 that estimates airless sprayer exposure (study 0467). The reviewer is urged to pull study 0467 and see if it matches his or her parameters.

SCENARIO 24. RIGHT-OF-WAY SPRAYER APPLICATION (APPL)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.175	+	0.850	+	0.878	=	**1.9**
Single Layer, No Gloves	0.175		0.210		0.878		**1.3**
Single Layer, Gloves	0.175		0.210		0.00954		**0.39**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 4 - 5, ABC grade. Hand replicates = 16, AB grade. **Low Confidence** due to lack of dermal replicates.
Single Layer, No Gloves	Dermal replicates = 4 - 20, ABCgrade. Hand replicates = 16, AB grade. **Low Confidence** due to lack of dermal replicates.
Single Layer, Gloves	Dermal replicates = 4 - 20, ABC grade. Hand replicates = 4, AB grade. **Low Confidence** due to lack of dermal and hand replicates.

Inhalation Exposure and Data Confidence

3.9 µg/lb ai handled. 16 replicates, A grade. **High Confidence**

SCENARIO 25. FLAGGER/LIQUID (FLAG)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00568		0.0444		0.00272	=	**0.053**
Single Layer, No Gloves	0.00663	+	0.00174	+	0.00272		**0.011**
Single Layer, Gloves	0.00663		0.00174		0.00313		**0.012**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	**Data Confidence/Items of Note**
No Clothes	Dermal = 17 to 57 replicates, ABC grade. Hand = 30 replicates, AB grade. **Medium Confidence**
Single Layer, No Gloves	Dermal = 18 to 28 replicates, AB grade. Hand = 30 replicates, AB grade. **High Confidence**
Single Layer, Gloves	Dermal = 18 to 28 replicates, AB grade. Hand = 6 replicates, AB grade**. Low Confidence** due to the small number of hand replicates.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 0.35 µg/lb ai applied. 28 replicates, AB grade. **High Confidence**

Note: Data are pooled from both the flagger in the treatment area and on the perimeter of the treatment area.

SCENARIO 26. FLAGGER/GRANULE (FLAG)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.000440	+	0.00458	+	0.0000219	=	**0.0050**
Single Layer, No Gloves	0.000440		No Data		0.0000219		**See Note** (below)
Single Layer, Gloves	0.000440		No Data		No Data		**See Note** (below)

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal = 16 to 20 replicates, ABC grade. Hand = 4 replicates, all grade**.** **Low Confidence** due to the inadequate hand replicate number and poor grade quality.
Single Layer, No Gloves	Replicates = NA. There are no data to estimate "single layer" or "gloved" exposure. The only way to obtain a rough estimate of "single layer" and/or "glove" exposure is to apply a protection factor to the "no clothing" or "no glove" values.
Single Layer, Gloves	Replicates = NA. There are no data to estimate "single layer" or "gloved" exposure. The only way to obtain a rough estimate of "single layer" and/or "glove" exposure is to apply a protection factor to the "no clothing" or "no glove" values.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 0.15 µg/lb ai handled. 4 replicates, E grade. **Low Confidence** due to the inadequate inhalation replicate number and poor grade quality.

SCENARIO 27. WETTABLE POWDER or LIQUID/OPEN POUR/AIRBLAST/OPEN CAB (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	1.04		17.9		7.25	=	**26**
Single Layer, No Gloves	1.04	+	No Data	+	7.25		**See Note** (below)
Single Layer, Gloves	1.04		No Data		No Data		**See Note** (below)

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 6 to 8, AB grade. Hand = 2 replicates, AB grade. This is a **Low Confidence** due to the extremely inadequate replicate number.
Single Layer, No Gloves	Replicates = NA. There are too many body parts with "0" observations. The only way to obtain a rough estimate of "single layer" and/or "glove" exposure is to apply a protection factor to the "no clothing" or "no glove" values.
Single Layer, Gloves	Replicates = NA. There are too many body parts with "0" observations. The only way to obtain a rough estimate of "single layer" and/or "glove" exposure is to apply a protection factor to the "no clothing" or "no glove" values.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 21 µg/lb ai handled. 8 replicates, AB grade. **Low Confidence** due to the inadequate inhalation replicate number

SPECIAL ITEMS OF NOTE FOR THIS USE SCENARIO: This use scenario includes both wettable powder replicates and liquid replicates in the Mixing/Loading portion of this analysis. This was only done because of the extremely limited number of replicates for this use scenario. This is not a recommended subsetting practice (under normal circumstances the formulation for the mixing/loading portion should have been wettable powder or liquid, but never the two combined). This is an **extremely Low Confidence use scenario**. The reviewer is advised to take the separate M/L value for liquid or wettable powder and the separate applicator exposure value for airblast and add them together.

SCENARIO 28. LIQUID/OPEN POUR/GROUNDBOOM/OPEN CAB (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.0314	+	0.524	+	0.321	=	**0.88**
Single Layer, No Gloves	0.0276		0.0225		0.321		**0.37**
Single Layer, Gloves	0.0276		0.0225		0.00654		**0.057**
Protective overalls over single layer gloves	0.0276		0.00207		0.00654		**0.036**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal = 16 to 36, AB grade. Hand = 29 replicates, ABC grade. **Medium Confidence**
Single Layer, No Gloves	Dermal = 17 to 67, ABC grade. Hand = 29 replicates, ABC grade. **Medium Confidence**
Single Layer, Gloves	Dermal = 17 to 67, ABC grade. Hand = 32 replicates, AB grade. **Medium Confidence**
Protective overalls over single layer gloves	Dermal = 7 to 67, ABC grade. Hand = 32 replicates, AB grade. **Low Confidence** due to inadequate replicate number.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 1.3 µg/lb ai handled. 26 replicates, AB grade. **High Confidence**

SCENARIO 29. LIQUID or DRY FLOWABLE/OPEN POUR/GROUNDBOOM/ENCLOSED CAB (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.00780		0.141		0.0731	=	**0.22**
Single Layer, No Gloves	0.00780	+	0.00807	+	0.0731		**0.089**
Single Layer, Gloves	0.00780		0.00807		0.0135		**0.029**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal = 29 to 38 replicates, ABC grade. Hand = 14 replicates, AB grade. **Low Confidence** due to inadequate replicate number.
Single Layer, No Gloves	Dermal = 17 to 38 replicates, ABC grade. Hand = 14 replicates, AB grade. **Low Confidence** due to inadequate replicate number.
Single Layer, Gloves	Dermal = 17 to 38 replicates, ABC grade. Hand = 24 replicates, AB grade. **Medium Confidence**

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 0.35 µg/lb ai handled. 15 replicates, ABC grade. **Medium Confidence**

This use scenario includes both dry flowable replicates and liquid replicates in the Mixing/Loading portion of this analysis. This was only done because of the limited number of replicates for some body parts for this use scenario. This is not a recommended subsetting practice (under normal circumstances the formulation for the mixing/loading portion should have been dry flowable or liquid, but never the two combined). The reviewer may wish to take the separate M/L value for liquid or dry flowable and the separate applicator exposure value for groundboom enclosed cab and combine them together.

SCENARIO 30. GRANULE/OPEN POUR/BELLY GRINDER (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.711	+	208	+	2.49	=	**210**
Single Layer, No Gloves	0.711		7.21		2.49		**10**
Single Layer, Gloves	0.711		7.21		1.39		**9.3**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 20 to 29, ABC grade. Hand replicates = 23, ABC grade. **Medium Confidence**
Single Layer, No Gloves	Dermal replicates = 29 to 45, ABC grade. Hand replicates = 23, ABC grade. **Medium Confidence**
Single Layer, Gloves	Dermal replicates = 29 to 45, ABC grade. Hand replicates = 20, All grades. **Low Confidence**

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 62 µg/lb ai applied. 40 replicates, AB grade. **High Confidence**

SPECIAL ITEMS OF NOTE FOR THIS USE SCENARIO: PLEASE NOTE: If only grades ABC are used for the gloved data (n=15), the "gloved" hand exposure would be significantly more than the “no gloved” hand exposure. This artifact results because the distribution type for the glove data is "normal" (arithmetic mean reported). Therefore, the estimate reported above is based on all grades in order to increase the sample size.

SCENARIO 31. "PUSH TYPE" GRANULAR SPREADER

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	No Data	+	No Data	+	1.83	**See Note** (Below)
Single Layer, No Gloves	No Data		1.09		1.83	**2.9**
Single Layer, Gloves	No Data		1.09		No Data	**See Note** (Below)

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 0. Hand replicates = 15, C grade. **Low Confidence** due to inadequate replicate number.
Single Layer, No Gloves	Dermal replicates = 0 to 15, C grade. Hand replicates = 15, C grade. **Low Confidence** due to inadequate replicate number. There are no head or neck replicates for this clothing scenario. All other body parts contain 15 replicates.
Single Layer, Gloves	Dermal replicates = 0 to 15, C grade. Hand replicates = 0. **Low Confidence** due to inadequate replicate number. There are no head, neck or hand replicates for this clothing scenario. All other body parts contain 15 replicates.

Inhalation Exposure and Data Confidence

6.3 µg/lb ai handled. 15 replicates, B grade. **High Confidence**

SCENARIO 32. LIQUID /OPEN POUR/LOW PRESSURE HANDWAND (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.300		4.32		102	=	**110**
Single Layer, No Gloves	0.300	+	0.126	+	102		**100**
Single Layer, Gloves	0.300		0.126		0.00208		**0.43**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 79 to 80, ABC grade. Hand replicates = 70, All grade**. Low Confidence** due to low hand grades used (lots of "E" grade.)
Single Layer, No Gloves	Dermal replicates = 9 to 80, ABC grade. Hand replicates = 70, All grade. **Low Confidence** due to inadequate replicate number and low hand grades used (lots of "E" grade.)
Single Layer, Gloves	Dermal replicates = 9 to 80, ABC grade. Hand replicates =10, ABC grade**. Low Confidence** due to inadequate replicate number. The gloved hand estimates are based almost entirely on non-detects.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 30 µg/lb ai handled. 80 replicates, ABC grade. **Medium Confidence**

SCENARIO 33. WETTABLE POWDER/OPEN POUR/LOW PRESSURE HANDWAND (MLAP)
(This may also be used for "crack and crevice" mixer/loader/applicator)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	1.55	+	127	+	No Data	=	**See Notes** (below)
Single Layer, No Gloves	1.55		4.78		No Data		**See Notes** (below)
Single Layer, Gloves	1.55		4.78		2.28		**8.6**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 16, ABC grade. Hand replicates = 0. **Low Confidence** due to lack of "no glove" hand data available for this use scenario.
Single Layer, No Gloves	Dermal replicates = 16, ABC grade. Hand replicates = 0. **Low Confidence** due to lack of "no glove" hand data available for this use scenario.
Single Layer, Gloves	Dermal replicates = 16, ABC grade. Hand replicates = 15, AB grade. **Medium Confidence**

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 1,100 µg/lb ai handled. 16 replicates, ABC grade. **Medium Confidence run**

SCENARIO 34. LIQUID/OPEN POUR/BACKPACK (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.742	+	22.1	+	No Data	=	**See Note** (below)
Single Layer, No Gloves	0.742		1.72		No Data		**See Note** (below)
Single Layer, Gloves	0.742		1.72		0.00462		**2.5**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 11, AB grade. Hand replicates = 0. **Low Confidence** due to the inadequate replicate number. "No glove" hand data are unavailable for this use scenario. Seven of the 11 glove observations are nondetect. It is not advisable to back calculate a "no glove" scenario.
Single Layer, No Gloves	Dermal replicates = 9 to 11, AB grade. Hand replicates = 0. **Low Confidence** due to the inadequate replicate number. "No glove" hand data are unavailable for this use scenario. Seven of the 11 glove observations are nondetect. It is not advisable to back calculate a "no glove" scenario.
Single Layer, Gloves	Dermal replicates = 9 to 11, AB grade. Hand replicates = 11, C grade**. Low Confidence** due to the inadequate replicate number.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 30 µg/lb ai applied. 11 replicates, A grade. **Low Confidence** due to inadequate replicate number.

SCENARIO 35. LIQUID/OPEN POUR/HIGH PRESSURE HANDWAND (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)		**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.525	+	41.3	+	No Data	=	**See Note** (below)
Single Layer, No Gloves	0.525		1.89		No Data		**See Note** (below)
Single Layer, Gloves	0.525		1.89		0.113		2.5

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 6 to 13, AB grade. Hand replicates = 0. "No glove" hand data are unavailable for this use scenario. The only way to estimate Total Dermal Exposure is to back calculate the glove exposure (2 of 13 nondetect). **Low Confidence**
Single Layer, No Gloves	Dermal replicates = 7 to 13, AB grade. Hand replicates = 0. "No glove" hand data are unavailable for this use scenario. The only way to estimate Total Dermal Exposure is to back calculate the glove exposure (2 of 13 nondetect). **Low Confidence**
Single Layer, Gloves	Dermal replicates = 7 to 13, AB grade. Hand replicates = 13, C grade. **Low Confidence** due to inadequate replicate number.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 120 µg/lb ai applied. 13 replicates, A grade. **Low Confidence** due to inadequate replicate number.

SPECIAL ITEMS OF NOTE FOR THIS USE SCENARIO: There is only ONE study in PHED that estimates exposure for this use scenario (#1024). The data were monitored in greenhouses; applications to floor, bench, and overhead plants (nozzle pressure not reported).

SCENARIO 36. LIQUID /OPEN POUR/GARDEN HOSE END SPRAYER (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.467	+	5.62	+	27.5	=	**34**
Single Layer, No Gloves	0.467		No Data		27.5		**See Note** (below)
Single Layer, Gloves	0.467		No Data		No Data		**See Note** (below)

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates= 8, C grade. Hand replicates = 8, E grade. **Low Confidence** due to inadequate replicate number and low grade confidence.
Single Layer, No Gloves	Replicates = N/A. There are no data available in this use scenario that estimates the "long sleeve shirt and long pants " clothing scenario. The only way to estimate exposure is to apply a protection factor to the total exposure data. **Very Low to Low Confidence** due to the low replicate number and poor grade quality.
Single Layer, Gloves	Replicates = N/A. There are no data available in this use scenario that estimates a "long sleeve shirt, long pants and glove" clothing scenario. The only way to estimate exposure is to apply a protection factor due to the total exposure data. **Very Low to Low Confidence** due to the low replicate number and poor grade quality.

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 9.5 µg/lb ai applied. 8 replicates, ABC grade. **Low Confidence** due to inadequate replicate number.

SPECIAL ITEMS OF NOTE FOR THIS USE SCENARIO: This is an extremely low confidence use scenario and should be viewed as a datagap. The hand grade is grade E and the replicate number is only 8. This use scenario is based on only one study (#0201). It should be viewed as a datagap.

SCENARIO 37. LIQUID/OPEN POUR/TERMITICIDE INJECTION (MLAP)

Dermal Exposure

Clothing Scenario	Head and Neck (mg/lb ai handled)		Upper and Lower Arm, Chest, Back, Thigh and Lower Leg (mg/lb ai handled)		Hand (mg/lb ai handled)	=	**TOTAL Dermal Exposure** (mg/lb ai handled)
No Clothing	0.0310	+	13.4	+	No Data	=	**See Note** (below)
Single Layer, No Gloves	0.0310		0.226		No Data		**See Note** (below)
Single Layer, Gloves	0.0310		0.226		0.103		**0.36**

Dermal Exposure Data Confidence and Items of Note

Clothing Scenario	Data Confidence/Items of Note
No Clothes	Dermal replicates = 17, AB grade. Hand replicates = 0. "No glove" hand data are unavailable for this use scenario. The only way to estimate TOTAL Dermal Exposure is to back calculate the glove exposure (1 of 17 nondetect). **Low Confidence**
Single Layer, No Gloves	Dermal replicates = 17, AB grade. Hand replicates = 0. "No glove" hand data are unavailable for this use scenario. The only way to estimate TOTAL Dermal Exposure is to back calculate the glove exposure (1 of 17 nondetect). **Low Confidence**
Single Layer, Gloves	Dermal and Hand replicates = 17, AB grade. **High Confidence**

Inhalation Exposure and Data Confidence

INHALATION EXPOSURE: 2.2 µg/lb ai applied. 17 replicates, AB grade. **High Confidence**

Note: Termiticide applied at various types of structures (e.g., slab foundation, poured basements, crawl space).

APPENDIX

Definitions of formulations and methods of application

LIQUID FORMULATIONS

SOLUTION
Formulation wherein the active ingredient dissolves readily in a liquid solvent to form a homogenous mixture.

EMULSIFIABLE CONCENTRATE
Solution of active ingredient with emulsifiers such as glycols and sulfonates to form a homogenous suspension. Usually diluted for use. Typical uses include crop sprays, insect repellent lotions.

AQUEOUS SUSPENSIONS
Also known as "flowables". A particulate which is premixed with a liquid to form a suspension. Usually diluted for use.

UNDILUTED LIQUID
Liquid pesticide concentrates which can often have a high percentile of active ingredient (50% or above). They are designed to be used as is, or diluted with a **small** quantity of a specified solvent.

MICROENCAPSULATED
A suspension designed for the slow release of pesticide due to the microencapsulation of the active ingredient in tiny beads or capsules. In consistency it is similar to a liquid.

SOLID FORMULATIONS

DUST
Active ingredient formulated with powdered dry inert substance such as talc or clay. **Insoluble** in water and containing no wetting or dispersing agents. Usually less than 30 μm in diameter. Most dust formulations are ready to use and contain a low percentage of active ingredient. Typical uses include crop and livestock dusts, seed treatments, tracking powders and pet products.

GRANULE
Vermiculite, attaclay, ground walnut shells, or other similar coarse particles impregnated with an active ingredient. **Insoluble**. Can range between 80 μm and 2360 μm in particle size. Usually larger than 500 microns. Most granular formulations are ready to use and

contain a low percentage of active ingredient. Typical uses include soil treatments, insect baits, and vaporizers.

WATER DISPERSIBLE GRANULES/DRY FLOWABLE
Similar to granule (above) except that it is **soluble** in water and is between granular and powder in particulate size. Usually includes a wetting or dispersing agent.

WETTABLE POWDER
Also known as dispersible or sprayable powders. Fine particulate solid containing wetting/dispersing agents which form a suspension that can "settle out" without frequent agitation. The highest proportion of particles are less than
5 μm, with none greater than 44μm. Most wettable powder formulations contain 50% or more active ingredient.

APPLICATION METHODS

AIRBLAST
An air sprayer in which the volume median diameter (VMD) of the spray is greater than 100 microns. They are typically trailer-mounted and large, with spray tanks ranging in size between 50 and 500 gallons and rotating "screens" that produce varying droplet sizes. The spray material is transported by pump from the tank where it is released into a high volume, high-speed air current produced by a fan or blower mounted behind the spray tank. Airblast equipment is used to apply dilute fungicides and insecticides to a variety of agricultural crops such as orchard crops, grapes, berries, and nursery crops. They are designed to deliver a high volume of spray to penetrate dense foliage crops.

BOOM SPRAYERS
Boom Sprayers are comprised of a tank for holding a reservoir of spray liquid, spray delivery lines to carry liquid to the nozzles, a bypass to return pumped liquid in excess of spray nozzle demand to the tank, a horizontal framework or boom on which the nozzles are mounted, and a pumping system. Tractor mounted booms are generally used for preplant and pre-emergent broadcast application of liquid pesticides, and for pos-emergent, band, or directed application to row crops.

AEROSOL CAN
A can holding pressurized liquid that is expelled by pushing a nozzle. The volume median diameter is typically less than 15 microns. Typically used for spot treatment or foggers.

AERIAL FIXED WING
Airplane application

AERIAL ROTARY WING
Helicopter application

HAND WAND
Light weight, hand operated sprayers. Their name is derived from the long metal extension which ends in an adjustable nozzle. A hose attaches the "wand" to a small portable tank or larger, stationary one. This type of sprayer can vary widely in type and pressure. The most commonly seen hand wands are compressed-air sprayers. The portable tanks may require occasional "shaking" by the applicator to assure a proper mixing of chemicals. They are often utilized for spot herbicide application in fields, crack and crevice treatments, along roadsides and in greenhouses.

BACKPACK
A spray tank that fits comfortably on the back like a knapsack. It contains a hand operated pump, a pressure chamber and a lance with an on/off tap or trigger valve and one or more nozzles. There is usually a UV-light inhibitor incorporated into the plastic. The usual tank capacity is about 15 litres so that the tank weight is not excessive to the handler. The volume of the tank is indicated by graduated marks, moulded in plastic tanks.

AIRLESS SPRAYER
Electrically powered handheld spraygun used in paint application.

RIGHTS-OF-WAY SPRAYER
Also known as a municipal sprayer. This "boom-less" sprayer utilizes off-center fan nozzles either as single or double units. The nozzle bodies are mounted on swivels and adjusted to different angles. Spray system is mounted on truck or rail car.

GARDEN HOSE-END SPRAYER
Attached to the end of a garden hose. When the hose is turned on, the water current runs across the opening of the siphon tube which leads to the bottom of the pesticide reservoir. The pesticide is drawn through the siphon tube and into the liquid stream and out the nozzle in a liquid spray. Hose-end sprayers are the most widely used home-and-garden sprayer and are commonly used for application of fungicides, herbicides, insecticides and fertilizers.

SOLID BROADCAST SPREADER (tractor/truck/AG uses)
Broadcast method of insecticide or herbicide application, usually in one of the following manners: 1) "Boom type" application, similar to groundboom application of a liquid formulation pesticide. The selected pesticide is placed in a hopper which contains a treadmill-type apparatus that moves the granules to evenly spaced nozzles and is

subsequently broadcast out in a fan-shaped pattern. 2) "Whirly-bird" or "spinning disk" method of application. The pesticide is placed in a funnel shaped hopper with a singular nozzle and subsequently broadcast out by the movement of a spinning disk or whirley bird which propels the pesticide outward. 3) Large wheeled hopper with evenly spaced holes in the bottom and a small treadmill which pushes the granules out (a large version of the residential broadcast spreader). The above methods of broadcast application are primarily used for preplant treatments.

SOLID BROADCAST SPREADER (belly grinder)
Small hopper strapped in front of the applicator which contains a "spinning disk" that projects the granules in a fan-shaped pattern in front of the applicator. Belly grinders are typically used for herbicide application by nurseries, greenhouses, homeowners and small-scale landscapers.

SOLID BROADCAST SPREADER (Scotts Type Residential)
Hand push-type solid broadcast spreader. This method of solid broadcast application is almost exclusively used by homeowners

TERMITICIDE INJECTION
Injection treatment wherein the termiticide is passed from a large stationary tank through a hose into a handheld compression chamber and "injected" via a metal rod into pre-drilled holes.

NON-DETECTS
A “non detect” means that no chemical residue was able to be measured on a particular dosimeter. When this is the case, half the limit of detection is assumed in PHED.

PPE
PPE is an acronym for Personal Protective Equipment. Common examples of PPE include respirators, chemical resistant aprons, gloves or even the addition of coveralls

Definition References -

EPA LUIS Users Guide
HED - Personal Communications, November 1995
PHED Taskforce - Personal Communications, November 1995
Matthew, G.A. 1992. Pesticide Application Methods